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Impact and Process Evaluation of the 2015 Illinois Power Agency Small Business Refrigeration Program

Final

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CADMUS

NAVIGANT

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1. Executive Summary

This report presents results from the evaluation of the Illinois Power Agency (IPA) Small Business Refrigeration Program for Program Year 8 (PY8), which ran from June 1, 2015 to May 31, 2016. The program provides direct install refrigeration/freezer measures to small business customers in Ameren Illinois Company (AIC)'s DS-2 rate class. The program targets independent grocers, bars and restaurants, convenience stores, and liquor stores that have refrigerators and freezers for food and beverages, as well as refrigerated cases for other food or beverage items. In PY8, the Small Business Refrigeration Program had energy savings goals approved by the Illinois Commerce Commission ("Commission" or "ICC") in the 2015 IPA Electricity Procurement Docket 14-0588 of 15,346 MWh in electric savings.[1]

Program activity began to pick up after the first 4 months of the program year. Over the course of PY8, eligible customers completed 289 projects through the Small Business Refrigeration Program. The program eventually achieved ex ante gross savings equal to 30% of its savings goal.

The evaluation of the PY8 Small Business Refrigeration Program involved both process and impact assessments. The process evaluation included a review of program-tracking data and program materials and interviews with program implementation staff to gauge program performance. Our impact evaluation research efforts involved applying deemed values from the Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4 (IL-TRM V4.0) to calculate gross impacts and applying the Illinois Stakeholder Advisory Group (SAG)-approved net-to-gross ratio (NTGR) of 0.86 to all measures to calculate net impacts. Key findings from the PY8 evaluation are presented below.

Program Impacts

Table 1 summarizes the electric energy and demand savings from the PY8 Small Business Refrigeration Program. The evaluation team calculated ex post gross savings by applying IL-TRM V4.0 deemed per-unit savings to verified measure quantities from the program-tracking database. The program achieved ex ante gross savings of 4,574 MWh and ex post gross savings of 4,611 MWh, which resulted in a 101% gross realization rate. We then applied the SAG-approved NTGR of 0.86 to the ex post gross impacts to get the ex post net impacts. The program achieved ex post net savings of 3,965 MWh.

Table 1. PY8 Small Business Refrigeration Program Net Impacts

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net
Energy Savings (MWh)					
Total MWh	4,574	101%	4,611	0.86	3,965
Demand Savings (MW)					
Total MW	N/Aa	N/A	0.32	0.86	0.28

[a] The program did not report ex ante gross demand savings.

Key Findings and Recommendations

We identified four key findings and made the following recommendations for program improvement.

[1] After program enrollment began slowly, Staples Energy developed a revised internal savings target of 2,937 MWh (19% of the ICC-approved savings goal) based on savings the program implementer believed could be achieved. This internal target was used solely to track likely savings for the remainder of the program year and did not supersede the ICC-approved savings goal.

- **Key Finding #1:** Program staff had difficulty finding program allies (typically mechanical/electrical contractors who deliver the program to customers) who had both the necessary knowledge and interest to install refrigeration energy efficiency measures. The program implementation plan cites recruiting program allies as the main barrier to project completion in PY8.
  - **Recommendation:** The program should continue to target allies with a utility and electrical background rather than a refrigeration or mechanical background. For future program offerings, an initial assessment of program ally interest (for example, via a survey of contractors who make up the target population for allies) prior to the kickoff of the program could serve to mitigate any surprise difficulties in ally recruitment.
  - **Recommendation:** The program should consider offering a tiered incentive structure to assist new allies. This incentive structure would offer higher incentives for the first several jobs completed by an ally and then return to a base level for jobs completed thereafter. This would serve to help compensate new allies for the extra time it may take to become familiar with the measures and reduce their need to pass higher costs on to their customers.
- **Key Finding #2:** The program employed a number of marketing efforts, including neighborhood sweeps of potential customers, mailings and emails to lists of potential DS-2 customers, and calls to grocery stores and gas stations. Of all these marketing techniques, neighborhood sweeps served to generate leads most effectively.
  - **Recommendation:** Program staff should use neighborhood sweeps as the primary marketing tool. Program allies should also be encouraged to market refrigeration measures to existing customers, including lighting customers.
- **Key Finding #3**: Different facility types achieve different savings for pre-rinse spray valves.
  - **Recommendation:** In order to apply the most accurate TRM default values and minimize discrepancies, the implementer should classify facilities that receive pre-rinse spray valves as either small, quick-service restaurants or medium-sized, casual dining restaurants.
- **Key Finding #4**: Significant savings differences exist for electronically commutated motors (ECMs) installed in freezers and coolers.
  - **Recommendation:** In order to apply the most accurate TRM default values and minimize discrepancies, the implementer should collect space type information for all ECM installations. A common nomenclature should be used to categorize space types, such as “freezer” and “cooler,” to ensure consistency across all measures. The space type information collected can be used to inform savings calculations.

2. Evaluation Approach

The evaluation of Program Year 8 (PY8) of the Illinois Power Agency's (IPA) Small Business Refrigeration Program, which ran from June 1, 2015 to May 31, 2016, involved both process and impact assessments. To support the process evaluation, we conducted a review of program materials and program-tracking data and interviews with program implementation staff. To evaluate gross impacts, the evaluation team reviewed the PY8 program-tracking data and applied the Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4 (IL-TRM V4.0). To assess net impacts, the evaluation team applied the Illinois Stakeholder Advisory Group (SAG)-approved net-to-gross ratio (NTGR) of 0.86 to ex post gross impacts.

2.1 Research Objectives

This evaluation addresses program performance in PY8 and the objective of the evaluation is to provide estimates of gross and net electric savings associated with the program. In particular, the PY8 impact evaluation answers the following questions:

- What were the estimated gross energy and demand impacts from this program?
- What were the estimated net energy and demand impacts from this program?

Given the narrow scope of PY8 activities, we conducted a limited process assessment to answer the following questions:

- Program Participation
  - What were the characteristics of participating customers? How many projects were completed? By how many different customers? What types of projects?
  - Did customer participation meet expectations? If not, how different was it and why?
- Program Design and Implementation
  - Was the program implemented as planned? If not, what changes were made, and why?
  - What, if any, implementation challenges occurred in PY8, and how were they overcome?

2.2 Evaluation Tasks

Table 2 summarizes the PY8 evaluation activities conducted for the Small Business Refrigeration Program.

Table 2. PY8 Evaluation Activities

Activity	PY8 Process	PY8 Impact	Details
Review of Utility Data and Program Materials	✓	✓	Reviewed all program materials and tracking data to document the design and implementation of the PY8 program
Program and Implementation Staff Interviews	✓		Provided insight into program design and processes
Gross Impact Analysis		✓	Reviewed program-tracking data and applied IL-TRM V4.0
Net Impact Analysis		✓	Applied SAG-approved NTGR

2.2.1 Review of Utility Data and Program Materials

The team conducted a comprehensive review of all tracking data and program materials, including the program implementation plan, program marketing materials, and extracts from the program-tracking database.

2.2.2 Program and Implementation Staff Interviews

We completed three interviews with Ameren Illinois Company (AIC) (program staff), Leidos (IPA Oversight), and Staples Energy (implementation staff) in June 2016. Topics discussed in these interviews included program performance in terms of goal achievement, program ally enrollment, marketing and outreach effectiveness, and ideas for future program improvement.

2.2.3 Impact Analysis

As previously noted, the team used the IL-TRM V4.0 to calculate ex post gross savings associated with the measures installed through the program. For net impacts, we applied the SAG-approved NTGR of 0.86 to gross savings.

2.3 Sources and Mitigation of Error

Table 3 provides a summary of possible sources of error associated with research tasks conducted for the Small Business Refrigeration Program. We discuss the sources of error below.

Table 3. Possible Sources of Error

Research Task	Survey Errors		Non-Survey Errors
	Sampling Errors	Non-Sampling Errors	
Impact Analysis	• N/A	• N/A	• Analysis errors

Non-Survey Errors

- **Analysis Errors**
  - **Impact Analysis:** We applied the TRM calculations to the participant data in the tracking database to calculate gross impacts, and applied the SAG-approved NTGR to calculate net impacts. To minimize analysis error, the evaluation team had all calculations reviewed by a separate team member to verify that calculations were performed accurately.

3. Detailed Evaluation Findings

3.1 Program Description

The Small Business Refrigeration Program was offered to customers for the first time in PY8. The program provides direct install refrigeration/freezer measures to small business customers in AIC's DS-2 rate class. The program targets independent grocers, bars and restaurants, convenience stores, and liquor stores that have refrigerators and freezers for food and beverages, as well as refrigerated cases for other food or beverage items.

The Small Business Refrigeration Program is implemented by Staples Energy and uses a network of program allies. The participation process begins with a free energy assessment conducted by a program ally. Allies use Energy Snapshot, an electronic tablet-based assessment tool, to gather information about the business and to identify potential opportunities for the installation of energy-efficient refrigeration equipment. After the assessment is complete, the customer receives a report that includes a list of recommended measures. If a customer chooses to complete a project, the program pays incentives that cover some or all of the measure installation costs.

The Small Business Refrigeration Program experienced challenges achieving its savings goal in PY8, as the program started slowly with only a handful of projects completed in the first 4 months. This slow start was largely due to difficulty finding allies trained in refrigeration measures with interest in completing the work.[2]

3.2 Process Analysis

3.2.1 Program Performance and Participation

As noted above, the Small Business Refrigeration Program was unable to meet the energy savings goals approved by the ICC due to limited program uptake. Table 4 presents the program energy savings goal.

Table 4. PY8 Small Business Refrigeration Program Energy Savings Goal

Metric	PY8 kWh Goal
Ex Ante Gross kWh Savings	15,345,547

In PY8, the program achieved 30% of the savings goal. Table 5 provides a high-level summary of various program performance metrics in PY8. The overall project conversion rate was 64%, indicating that more than one-third of assessments were not converted into completed projects. If all the audits in the program-tracking database had resulted in completed projects, the program would have achieved 6,249,000 kWh in ex ante gross savings, 136% of the actual ex ante gross savings.[3]

[2] After program enrollment began slowly, Staples Energy developed a revised internal savings target of 2,937 MWh (19% of the ICC-approved savings goal) based on savings the program implementer believed could be achieved. This internal target was used solely to track likely savings for the remainder of the program year and did not supersede the ICC-approved savings goal. The program surpassed this internal target.

[3] The program-tracking database contains ex ante savings assumptions for recommended measures for all sites assessed, regardless of whether or not a project was completed at each site. This cited value is inclusive of ex ante savings assumptions for all sites.

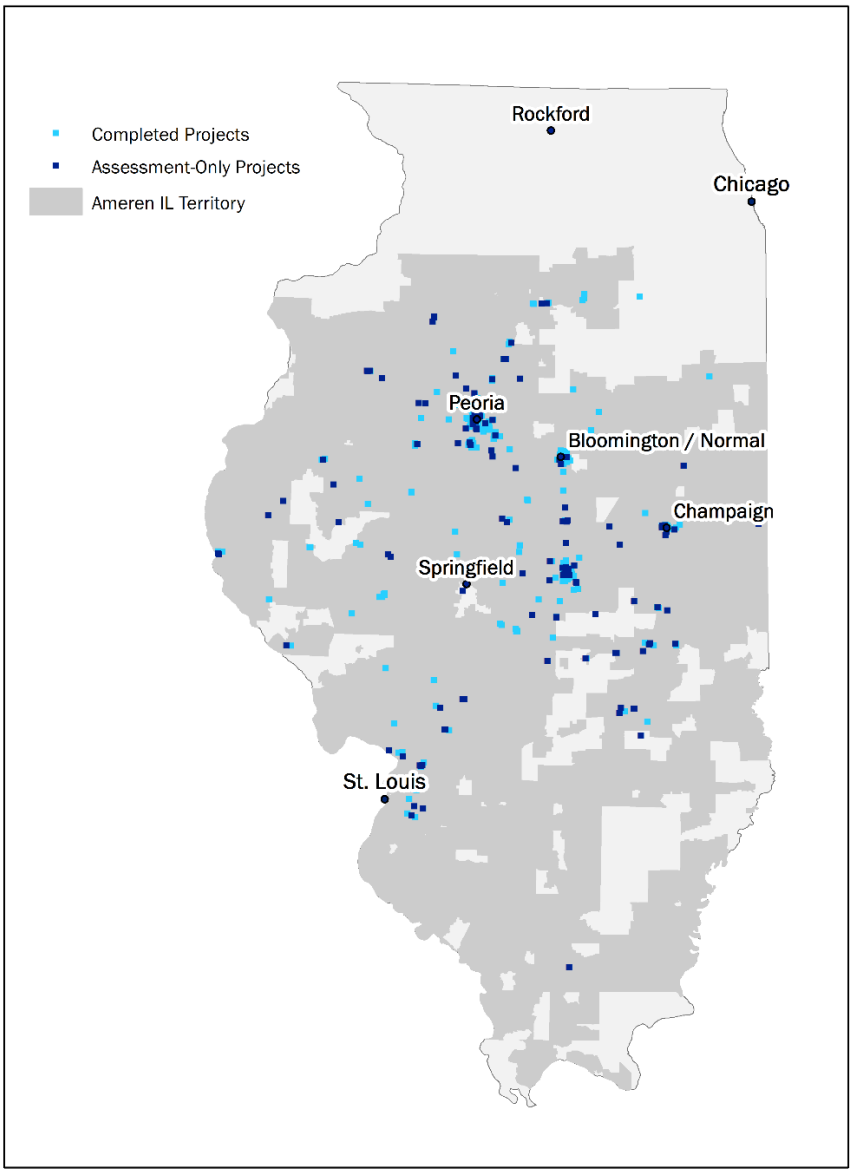
Table 5. PY8 Small Business Refrigeration Program Performance

Metric	PY8 Outcome
Ex Ante Gross Savings (kWh)	4,574,000
Assessments Completed	453
Projects Completed	289
Conversion Rate	64%
Measures Installed	7,126
Participating Program Allies	15

Program ally participation was an important factor in the performance of the program. Program staff suspect that allies may have left the program due to the low profitability of the projects in comparison to other programs. In addition, program staff mentioned that out of the 15 program allies who completed a project, only around half were active year-round. Staff mentioned that doubling the number of "active" program allies might help increase the conversion rate and achieve program goals, as there would be additional allies to follow through with audits if other allies left to participate in other programs. Furthermore, the program had a lack of allies in southern service territories around Carbondale, Mount Vernon, and Marion (evident by the lack of projects in these areas [see Figure 1]) and program staff would like to work to increase program activity in these areas.

Figure 1 shows the geographic distribution of completed assessments and completed projects across the AIC service territory. Projects were distributed across the AIC service territory, with some expected concentration around urban areas.

Figure 1. Distribution of PY8 Small Business Refrigeration Assessments and Projects



Note: 11 of 164 assessment-only projects are not included in this map due to incomplete addresses.

3.2.2 Barriers to Program Implementation

Program and implementation staff offered several reasons why the program performed below expectations. First, refrigeration measures have not previously been a substantial part of the energy efficiency programs offered in AIC territory. As a result, program staff recognized that this program faced challenges typical for new programs in that there was a learning curve for all parties involved. These challenges included recruiting, training, and retaining program allies, and working out program logistics.

From a financial perspective, program staff felt that incentives offered for this program may have originally been set too low to encourage program allies to enter the market. Furthermore, as new allies with little experience with refrigeration measures entered the program, they often had a difficult time figuring out how to set price points for measure installation at a level where they could 1) turn a profit and 2) pass incentives on to customers. When program allies gained experience and became more accustomed to identifying and installing the measures, their costs of doing business came down and program incentives offset a greater share of project costs, which resulted in higher levels of customer participation.

Program staff indicated that assumptions about ally enrollment were based on results from other, urban service areas, and that these predictions did not hold true for AIC's service area, which is considerably more rural. Implementation staff originally sought program allies with a refrigeration or mechanical background, but found that these contractors wanted to focus on service and sales work rather than utility work. Furthermore, program staff told the evaluation team that they then switched to recruiting electrical contractors with a background in utility work and that these allies proved to be better targets for the program.

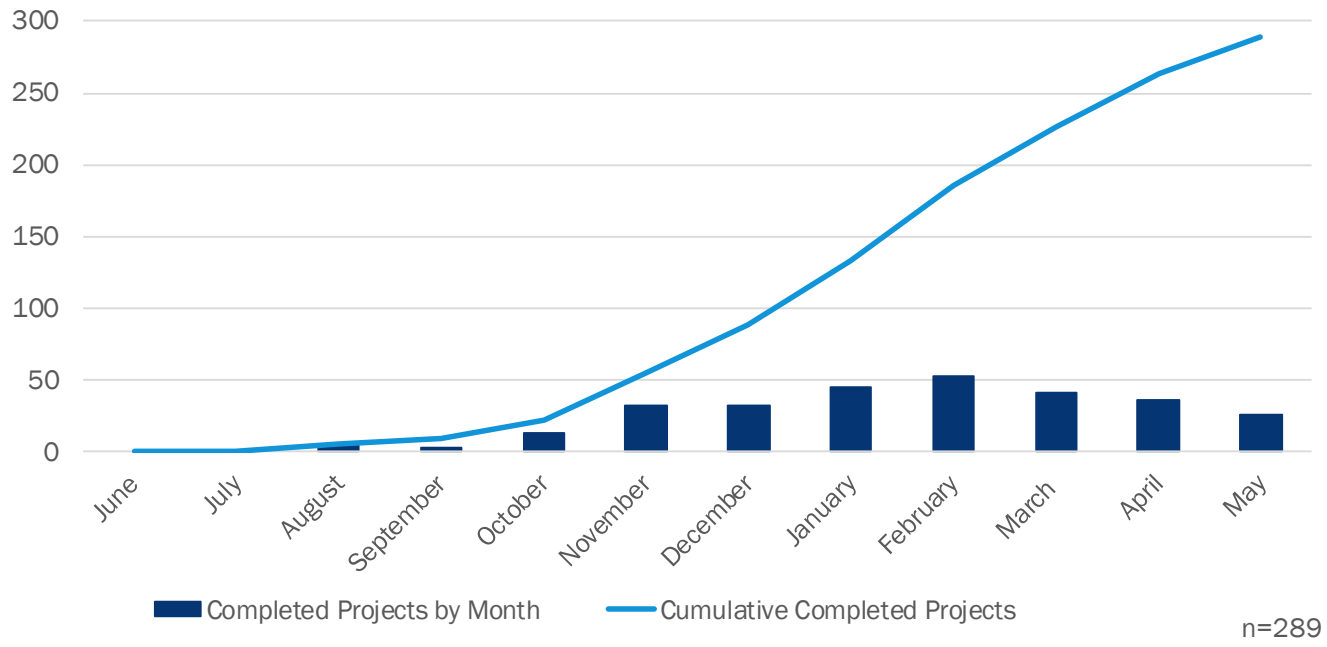
The utility allies often had little familiarity with refrigeration measures, and therefore implementation staff assisted the allies with conducting the assessments, installing the measures, and finding vendors that carried the equipment necessary to complete the measures. Program staff elaborated that lighting specialists did not want to work on refrigeration measures and refrigeration specialists did not want to work on specific lighting measures included within the refrigeration program. Furthermore, program staff faced competition for allies from other similar programs, such as the Small Business Direct Install Program. In addition, program staff let us know that they had difficulty with ally retention, as allies were often drawn away to work on other programs. As a result, staff ended up training more allies than actually ended up completing the measures.

3.2.3 Program Participation and Implementation

As seen in Figure 2, program uptake was very slow at the beginning of PY8. In particular, there was only a minimal number of projects completed for the first 4 months of the program year, and program activity did not start to take off until October. Program staff felt that once the program was fully implemented, customers were very satisfied with the program.

According to program-tracking data, 15 allies completed projects, but 6 completed the bulk of the projects (13+ projects each). These six active program allies primarily had lighting, electrical, or energy efficiency backgrounds.

Figure 2. PY8 Small Business Refrigeration Projects Completed, by Month



The evaluation team explored a number of factors related to program implementation.

- **Program Ally Training:** In order to increase the number of active program allies, the implementation staff told us that they conducted more comprehensive program ally training and provided more assistance to the allies than originally planned. Implementation staff assisted allies with finding leads, which in turn helped them recruit allies to the program. Additionally, implementation staff brought in a technical expert to teach allies about installing the measures, and the expert went out into the field to help allies with installation. Furthermore, implementation staff provided allies with a list of vendors that supply the type of equipment allies needed to perform installations.

- **Program Ally Bonus Structure:** In November 2015, implementation staff began offering bonuses to trade allies to encourage participation. The bonuses offered were both measure-based, where bonuses were offered to allies for installing specific measures targeted by the program, and dollar amount-based, where bonuses were offered if an ally hit a total target dollar amount of measures sold. Implementation staff felt that these bonuses helped encourage ally participation and program uptake.

- **Data Collection Tools and Processes:** Implementation staff used Energy Snapshot, tablet-based software that can be used to record key characteristics of a potential customer's property. Energy Snapshot information is then sent to a database called the Vault, which is used to generate an audit for the customer. Implementation staff felt that the Energy Snapshot and Vault data-tracking system functioned effectively, as they rarely heard complaints from program allies about the system and many allies were already accustomed to the system from experience with other programs. The high percentage of program allies new to the program prompted the program implementer to conduct more Quality Assurance/Quality Control (QA/QC) checks than originally planned. They also began to inspect every project that was implemented. Secondary QA/QC inspections by the Leidos IPA Oversight team revealed only a few minor issues and the program staff was generally very responsive to fixing these issues.

Table 6 shows that, although the largest number of assessments were completed in convenience stores (157, 35%), convenience stores had the lowest conversion rate (57%). In contrast, program allies had more success with conversions among restaurants (the facility type making up the second largest number of assessments). Restaurants accounted for the largest number of completed projects (96) and the highest conversion rate (79%).

Table 6. Share of Assessments and Projects, by Facility Type

Facility Type	Count of Assessments (n=453)	Count of Completed Projects (n=289)	Conversion Rate
Convenience Store	157	89	57%
Restaurant	121	96	79%
Grocery Store	69	44	64%
Liquor Store	59	35	59%
Tavern/Bar	12	8	67%
Retail/Service	10	7	70%
Other	9	6	67%
Unknown	16	4	25%
Total	**453**	**289**	**64%**

It is also interesting to note that chain businesses made a large contribution to the number of projects completed in PY8. Fifteen different chains completed assessments at multiple locations, and 11 chains completed projects at multiple locations (21% of all projects). The two most active chains completed projects at 17 and 13 different sites, respectively.

3.2.4 Marketing and Outreach

The Small Business Refrigeration Program conducted a series of marketing efforts, largely implemented by program staff. These efforts included neighborhood sweeps of potential customers, mailings and emails to lists of potential DS-2 customers, and calls to grocery stores and gas stations. As previously noted, program staff found the neighborhood sweeps to be the most effective form of marketing. In addition, once program allies became more familiar with the program, they assisted with the program's marketing efforts and marketed on their own.

3.3 Impact Results

The program achieved ex ante gross savings of 4,574 MWh and ex post gross savings of 4,611 MWh, which resulted in a 101% gross realization rate. We applied the SAG-approved NTGR of 0.86 to the ex post gross impacts to get the ex post net impacts, which totaled 3,965 MWh. Table 7 summarizes the electric energy and demand savings from the PY8 Small Business Refrigeration Program.

Table 7. PY8 Small Business Refrigeration Program Net Impacts

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net
Energy Savings (MWh)					
Total MWh	4,574	101%	4,611	0.86	3,965

Demand Savings (MW)					
Total MW	N/A[a]	N/A	0.32	0.86	0.28

[a] The program did not report ex ante gross demand savings.

To estimate PY8 ex post gross savings for the Small Business Refrigeration Program, we conducted an engineering review of the program-tracking database and developed verified measure quantities. We then applied deemed values from the IL-TRM V4.0 to these verified measure quantities. The TRM does not provide default in-service rates (ISRs) for the measures installed through the Small Business Refrigeration Program. Therefore, the evaluation team applied an ISR of 100%, which is a common assumption for direct install measures. For net impacts, we applied the SAG-approved NTGR of 0.86 to all measures installed through the program.

3.3.1 Measure Verification

As part of the PY8 impact evaluation, the evaluation team completed a thorough review of the program-tracking database to determine ex ante, audited, and verified total quantities by measure (Table 8). The evaluation team audited measure quantities by checking for duplicates and data entry errors. We also compared the total incentive amounts with the total energy savings provided in the database to confirm consistency. Overall, the audited measure quantities closely matched ex ante quantities. However, we adjusted the ex ante quantities for the LED Cold Case Lighting and Controls – Glass Front Refrigerated Cooler measures.[4] The adjustments resulted in one additional measure overall, which represents an increase of less than 1% of the total program measure volume. To determine verified measure quantities, the evaluation team applied an ISR of 100% to all measures.

Table 8. PY8 Small Business Refrigeration Measure Quantities and In-Service Rates

Measure Category	Ex Ante Measure Quantity[a]	Audited Measure Quantity	In-Service Rate[b]	Verified Measure Quantity
LED Cold Case Lighting	2,855	2,857	100%	2,857
Electronically Commutated Motor (ECM) - Walk-In	1,095	1,095	100%	1,095
Anti-Sweat Door Heater - Low Temp	751	751	100%	751
Anti-Sweat Door Heater - High Temp	501	501	100%	501
Evaporator Fan Controls	351	351	100%	351
Anti-Sweat Door Heater - Medium Temp	348	348	100%	348
Controls - Glass Front Refrigerated Cooler	291	290	100%	290
Auto Door Closers - Walk-In Cooler	280	280	100%	280
ECM - Reach-In - Grocery	263	263	100%	263
Walk-In Freezer Strip Curtains	152	152	100%	152
Auto Door Closers - Walk-In Freezer	133	133	100%	133
Control - Refrigerated Beverage Vending Machine	96	96	100%	96
Pre-Rinse Spray Valve - Electric Only	10	10	100%	10
Total	7,126	7,127	N/A	7,127

[a] Source: Evaluation team analysis of final program-tracking data (07-08-2016).

[4] The ex ante quantities of these two measures were adjusted to accurately reflect the total energy savings and total incentives reported in the tracking database.

[b] In the absence of TRM default ISRs, assumed 100% for direct install programs.

3.3.2 Ex Post Gross Impact Results

Overall, total ex post gross energy and demand impacts for the PY8 Small Business Refrigeration Program were 4,611 MWh and 0.32 MW. Table 9 summarizes PY8 ex post gross impacts associated with the Small Business Refrigeration Program based on TRM algorithms. We explain potential reasons for differences between ex ante and ex post gross impacts following the table, and provide specific inputs for all ex post savings estimates in Appendix A.

Table 9. PY8 Small Business Refrigeration Program Ex Post Gross Impacts

Measure Category	Verified Measure Quantity	Ex Ante Gross		Ex Post Gross			Realization Rate[a]
		MWh	Percent of Ex Ante MWh	MW	MWh	Percent of Ex Post MWh	MWh
LED Cold Case Lighting	2,857	751	16.4%	0.11	765	16.6%	102%
ECM - Walk-In	1,095	435	9.5%	0.05	444	9.7%	102%
Anti-Sweat Door Heater - Low Temp	751	960	21.0%	N/A	960	20.9%	100%
Anti-Sweat Door Heater - High Temp	501	256	5.6%	N/A	256	5.6%	100%
Evaporator Fan Controls	351	338	7.4%	0.02	338	7.3%	100%
Anti-Sweat Door Heater - Medium Temp	348	188	4.1%	N/A	188	4.1%	100%
Controls - Glass Front Refrigerated Cooler	290	351	7.7%	N/A	351	7.6%	100%
Auto Door Closers - Walk-In Cooler	280	264	5.8%	0.04	264	5.7%	100%
ECM - Reach-In - Grocery	263	103	2.3%	0.01	103	2.2%	100%
Walk-In Freezer Strip Curtains	152	452	9.9%	0.05	452	9.8%	100%
Auto Door Closers - Walk-In Freezer	133	307	6.7%	0.04	307	6.7%	100%
Control - Refrigerated Beverage Vending Machine	96	153	3.3%	N/A	155	3.4%	101%
Pre-Rinse Spray Valve - Electric Only	10	17	0.4%	N/A	28	0.6%	163%
Total	**7,127**	**4,574**	**100.0%**	**0.32**	**4,611**	**100.0%**	**101%**

[a] Realization rate = ex post value ÷ ex ante value.

The evaluation team did not receive ex ante savings assumptions for the Small Business Refrigeration Program in PY8. Therefore, to determine the ex ante assumptions used in the database, we back-calculated the per-measure savings by dividing the project-level ex ante gross savings by the quantity. While there are very minor discrepancies between ex ante and ex post gross savings at the program level, we highlight several potential reasons for the discrepancies that do exist. These reasons include (in order of importance):

- **Ex ante and ex post calculations for pre-rinse spray valves used different hours per day assumptions.** Savings for pre-rinse spray valves follow the IL-TRM V4.0 methodology in both ex ante and ex post calculations. The ex ante savings in the database apply a value of 0.61 hours per day. Ex post savings apply an average of 1.0 hours per day, which assumes an equal split between small, quick-service restaurants (0.5 hours per day) and medium-sized, casual dining restaurants (1.5 hours per day). We

base the assumption of an equal split on a review of the PY8 participant database and the types of facilities that received this measure.

- **Ex post calculations differentiate between freezers and coolers for ECMs installed in walk-ins.** Ex ante savings for ECMs installed in restaurant and grocery store walk-ins used the IL-TRM V4.0 average default savings values for restaurants and grocery stores, which assume that 80% of ECM measures are installed in walk-in coolers and 20% are installed in walk-in freezers. To determine ex post savings, the evaluation team calculated a weighted average using the quantity of ECM measures installed in walk-in coolers and freezers in PY8. The program database provides space type descriptions of where ECMs are installed (e.g., "main cooler," "freezer," "vending machine," "entrance," "back wall"). However, this information was not collected for all ECM measures and there was no standardized nomenclature. The implementers assigned the space type of the ECM as either freezer or cooler based on the description. However, the space type information was not used to inform ex ante savings calculations. For measures without space type information, we applied a weighted average.

3.3.3 Ex Post Net Impact Results

To determine the overall net savings associated with the Small Business Refrigeration Program, the team applied the SAG-approved NTGR (0.86) to ex post gross savings. As a result, the program achieved a net realization rate of 101% for electric energy.

Table 10. Small Business Refrigeration Program Net Impacts

Program	Ex Ante Net Impacts		Ex Post NTGR	Ex Post Net Impacts	
	MW	MWh		MW	MWh
Small Business Refrigeration	N/A	3,934	0.86	0.28	3,965
			Net Realization Rate[a]	N/A	101%

[a] Net realization rate = ex post net value ÷ ex ante net value.

4. Conclusions and Recommendations

The Small Business Refrigeration Program did not meet the energy savings goal approved by the ICC largely due to low levels of program enrollment. This slow start to enrollment is typical for new programs, as it takes time to recruit and train allies and work out program logistics. Below, we identify some of the key reasons for the slow ramp-up of the program and offer recommendations for addressing these issues in the future.

We identified four key findings and made the following recommendations for program improvement:

- **Key Finding #1:** Program staff had difficulty finding program allies who had both the necessary knowledge and interest to install refrigeration energy efficiency measures. The program implementation plan cites recruiting program allies as the main barrier to project completion in PY8.
  - **Recommendation:** The program should continue to target allies with a utility and electrical background rather than a refrigeration or mechanical background. For future program offerings, an initial assessment of program ally interest (for example, via a survey of contractors who make up the target population for allies) prior to the kickoff of the program could serve to mitigate any surprise difficulties in ally recruitment.
  - **Recommendation:** The program should consider offering a tiered incentive structure to assist new allies. This incentive structure would offer higher incentives for the first several jobs completed by an ally and then return to a base level for jobs completed thereafter. This would serve to help compensate new allies for the extra time it may take to become familiar with the measures and reduce their need to pass higher costs on to their customers.
- **Key Finding #2:** The program employed a number of marketing efforts, including neighborhood sweeps of potential customers, mailings and emails to lists of potential DS-2 customers, and calls to grocery stores and gas stations. Of all these marketing techniques, neighborhood sweeps served to generate leads most effectively.
  - **Recommendation:** Program staff should use neighborhood sweeps as the primary marketing tool. Program allies should also be encouraged to market refrigeration measures to existing customers, including lighting customers.
- **Key Finding #3**: Different facility types achieve different savings for pre-rinse spray valves.
  - **Recommendation:** In order to apply the most accurate TRM default values and minimize discrepancies, the implementer should classify facilities that receive pre-rinse spray valves as either small, quick-service restaurants or medium-sized, casual dining restaurants
- **Key Finding #4**: Significant savings differences exist for ECMs installed in freezers and coolers.
  - **Recommendation:** In order to apply the most accurate TRM default values and minimize discrepancies, the implementer should collect space type information for all ECM installations. A common nomenclature should be used to categorize space types, such as “freezer” and “cooler,” to ensure consistency across all measures. The space type information collected can be used to inform savings calculations.

Appendix A. Small Business Refrigeration Program Assumptions and Algorithms

LED Cold Case Lighting

The evaluation team used the following equations from the IL-TRM V4.0 to estimate energy and demand savings for LED cold case lighting.

Equation 1. LED Cold Case Lighting Energy Algorithm

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1{,}000}\right) \times ISR \times Hours \times WHFe$$

Equation 2. LED Cold Case Lighting Demand Algorithm

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1{,}000}\right) \times ISR \times CF \times WHFd$$

Table 11 provides assumptions used to estimate ex post savings for LED cold case lighting measures.

Table 11. Ex Post Assumptions for LED Cold Case Lighting

Parameter	Value	Units	Notes/Reference
$Watts_{base}$	Refrigerated case: 15.2 Freezer case: 18.7	Watts	IL-TRM V4.0
$Watts_{EE}$	Refrigerated case: 7.6 Freezer case: 7.7	Watts	
W/kW	1,000	W/kW	Conversion factor
ISR	100%	N/A	In the absence of TRM default values for direct install measures, assume 100%
Hours	5,802	Hours	IL-TRM V4.0
WHFe	Refrigerated case: 1.29 Freezer case: 1.50	N/A	
WHFd	Refrigerated case: 1.29 Freezer case: 1.50	N/A	
CF	0.69	N/A	

Electronically Commutated Motors for Walk-In and Reach-In Coolers and Freezers

The evaluation team applied the following deemed savings assumptions from the IL-TRM V4.0 to estimate energy and demand savings for ECMs (Table 12).

Table 12. Ex Post Per-Measure Savings for ECMs

Measure	kWh	kW	Notes/Reference
ECM - Reach In - Grocery	392	0.051	IL-TRM V4.0
ECM - Walk In - Cooler	357	0.044	IL-TRM V4.0 weighted by facility type
ECM - Walk In - Freezer	559	0.051	
Average ECM	406	0.046	

Anti-Sweat Door Heater Controls

The evaluation team used the following equation from the IL-TRM V4.0 to estimate energy savings for anti-sweat door heater controls. The TRM currently does not provide methodology for estimating demand savings.

Equation 3. Anti-Sweat Door Heater Control Energy Algorithm

$$\Delta kWh/door = kW_{base} \times ESF \times BF \times Hours$$

Table 13 provides assumptions used to estimate ex post energy savings for anti-sweat door heater controls.

Table 13. Ex Post Assumptions for Anti-Sweat Door Heater Controls

Parameter	Value	Units	Notes/Reference
kW_{base}	Freezer: 0.195 Cooler: 0.092	Connected load (kW)	IL-TRM V4.0
Energy Savings Factor (ESF)	0.55	N/A	Percentage of hours annually that the door heater is powered off due to humidity-based controls (IL-TRM V4.0)
Bonus Factor (BF)	Low Temp: 1.36 Med Temp: 1.22 High Temp: 1.15	N/A	Represents the increased savings due to reduction in cooling load inside the cases and the increased cooling load in the building space to cool the additional heat generated by door heaters (IL-TRM V4.0)
Hours	8,766	Hours	

Evaporator Fan Controls

The evaluation team applied the default savings values provided in Table 14 to estimate ex post savings for evaporator fan controls.

Table 14. Ex Post Per-Measure Savings for Evaporator Fan Controls

Measure	kWh Savings	kW Savings	Notes/Reference
Evaporator Fan Motors	481	0.060	IL-TRM V4.0

Beverage and Snack Machine Controls

The evaluation team used the following equation from the IL-TRM V4.0 to estimate energy savings for beverage and snack machine controls. The TRM currently does not provide methodology for estimating demand savings.

Equation 4. Beverage and Snack Machine Controls Energy Algorithm

$$\Delta kWh = \left(\frac{Watts_{base}}{1{,}000}\right) \times Hours \times ESF$$

Table 15 provides assumptions used to estimate ex post savings for beverage and snack machine controls.

Table 15. Ex Post Assumptions for Beverage and Snack Machine Controls

Parameter	Value	Units	Notes/Reference
$Watts_{base}$	Refrigerated beverage vending machines: 400 Non-refrigerated snack vending machine: 85 Glass front refrigerated coolers: 460	Connected kW	IL-TRM V4.0
W/kW	1,000	W/kW	Conversion factor
Hours	8,766	Hours	IL-TRM V4.0
ESF	Refrigerated beverage vending machines: 0.46 Non-refrigerated snack vending machine: 0.46 Glass front refrigerated coolers: 0.30	N/A	

Auto Door Closers

The evaluation team applied the default savings values provided in Table 16 to estimate ex post savings for auto door closers.

Table 16. Ex Post Per-Measure Savings for Auto Door Closers

Measure	kWh Savings	kW Savings	Notes/Reference
Auto Door Closer - Walk-In Cooler	943	0.137	IL-TRM V4.0
Auto Door Closer - Walk-In Freezer	2,307	0.309	

Walk-In Freezer Strip Curtains

The evaluation team used the following equations from the IL-TRM V4.0 to estimate energy and demand savings for walk-in freezer strip curtains.

Equation 5. Walk-In Freezer Strip Curtain Energy Algorithm

$$\Delta kWh = 2{,}974$$

Equation 6. Walk-In Freezer Strip Curtain Demand Algorithm

$$\Delta kW = \frac{\Delta kWh}{8{,}766 \times CF}$$

Table 17 provides assumptions used to estimate ex post savings for walk-in freezer strip curtain measures.

Table 17. Ex Post Assumptions for Walk-In Freezer Strip Curtains

Parameter	Value	Units	Notes/Reference
ΔkWh	2,974	kWh	IL-TRM V4.0
Hours	8,766	Hours	
CF	1	N/A	

Pre-Rinse Spray Valves

The evaluation team used the following equations from the IL-TRM V4.0 to estimate energy savings for pre-rinse spray valves. The TRM currently does not provide methodology for estimating demand savings.

Equation 7. Pre-Rinse Spray Valve Energy Algorithm

$$\Delta kWh = \Delta Gallons \times 8.33 \times 1 \times (Tout - Tin) \times \frac{1}{EFF_{electric}} \times \frac{1}{3{,}413}$$

Equation 8. Pre-Rinse Spray Valve Gallons Algorithm

$$\Delta Gallons = (FLObase - FLOeff) \times MINhour \times HOURSday \times DAYSyear$$

Table 18 provides assumptions used to estimate ex post savings for pre-rinse spray valve measures.

Table 18. Ex Post Assumptions for Pre-Rinse Spray Valves

Parameter	Value	Units	Notes/Reference
ΔGallons	Calculated	gallons	Calculated
Tout	124.1	°F	Water heater outlet water temperature (IL-TRM V4.0)
Tin	54.1	°F	Inlet water temperature (IL-TRM V4.0)
Specific mass of one gallon of water	8.33	lbm/gal	IL-TRM V4.0
Specific heat of water	1	Btu/lbm°F	
$EFF_{electric}$	0.97	N/A	Efficiency of electric water heater (IL-TRM V4.0)
FLObase	1.9	gal/min	Base case flow (IL-TRM V4.0)
FLOeff	1.06	gal/min	Efficient case flow (IL-TRM V4.0)
MINhour	60	min/hour	IL-TRM V4.0
HOURSday	1.0	hour/day	Assume average between small, quick-service restaurants (0.5 hours/day) and medium-sized, casual dining restaurants (1.5 hours/day) (IL-TRM V4.0)
DAYSyear	312	days/year	IL-TRM V4.0

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